PROPOSED REGULATION ORDER

AIRBORNE TOXIC CONTROL MEASURE TO REDUCE EMISSIONS OF HEXAVALENT CHROMIUM AND NICKEL FROM THERMAL SPRAYING

Adopt new section 93102.5, title 17, California Code of Regulations, to read as follows:

93102.5. Airborne Toxic Control Measure to Reduce Emissions of Hexavalent Chromium and Nickel from Thermal Spraying.

(a) Applicability

(1) This regulation shall apply to each thermal spraying operation at a stationary source that uses materials containing chromium, chromium compounds, nickel, or nickel compounds. This regulation does not apply to portable thermal spraying operations.

(b) Definitions

For the purposes of this section, the following definitions shall apply:

(1) "*Air Pollution Control System"* means equipment that is installed for the purpose of collecting and containing emissions of airborne particles from thermal spraying operations. “Air Pollution Control System” includes, but is not limited to, enclosures, exhaust hoods, ductwork, fans/blowers, particulate control devices, and exhaust stacks/vents.

(2) *“Control Device”* means a device that reduces emissions of particulate matter. “Control Device” includes, but is not limited to, dry filter cartridges, HEPA filters, water curtains, cyclones, baghouses, and scrubbers.

(3) *“Detonation Gun Spraying”* means a thermal spraying process in which the coating material is heated and accelerated to the workpiece by a series of detonations or explosions from oxygen-fuel gas mixtures.

(4) *“Dry Filter System”* means a dry particulate filter control system that uses filter media to remove particulate emissions from the exhaust air stream.

(5) *"Enclosure"* means a structure, such as a booth, that surrounds a thermal spraying process and captures and contains particulate emissions and vents them to a control device. Enclosures may have permanent or temporary openings.

(6) *"Existing Thermal Spraying Operation"* means a thermal spraying process that is in operation prior to or on July 1, 2005.

(7) *"Flame Spraying"* means a thermal spraying process in which an oxygen/fuel gas flame is the source of heat for melting the surfacing material.

(8) *"High Efficiency Particulate Air (HEPA) Filter"* means a disposable, dry filter that has a minimum particle collection efficiency of 99.97 percent when tested with a mono-disperse 0.3 um test aerosol.

(9) *"Hexavalent chromium"* means the form of chromium with a valence state of +6.

(10) *"High-Velocity Oxy-Fuel (HVOF) Spraying"* means a thermal spray process in which particles are injected into a high-velocity jet formed by the combustion of oxygen and fuel.

(11) *"Independent Tester"* means a person who engages in the testing of stationary sources to determine compliance with air pollution laws or regulations and who meets all of the following criteria:

(A) The independent tester is not owned in whole or in part by the owner/operator of the thermal spraying operation;
(B) The independent tester has not received gross income from the owner/operator of the thermal spraying operation in excess of $100,000 or in excess of 10% of the tester's annual revenues, other than as a result of source test contracts;
(C) The independent tester has not manufactured or installed any emission control device or monitor used in connection with the specific source to be tested; and
(D) When conducting the compliance test, the independent tester shall not use any employee or agent who:
1. holds a direct or indirect investment of $1,000 or more in the owner/operator of the thermal spraying operation; or
2. has directly received income in excess of $250 from the owner/operator of the thermal spraying operation in the previous 12 months; or
3. is a director, officer, partner, employee, trustee, or holds any position of management in the owner/operator of the thermal spraying operation.

(12) *"Initial Startup"* means the first time a new thermal spraying operation begins production or the first time additional or modified equipment is put into operation at a modified source. Initial startup does not include operation solely for testing of equipment or subsequent startup of permit units following malfunction or shutdown.

(13) *"Intake Area"* means the area of the opening(s) in an enclosure from which make-up air is drawn from outside the enclosure during normal operations.

(14) *"Inward Face Velocity"* means the airflow in cubic feet per minute (cfm) divided by the open intake area in square feet, measured in accordance with Appendix 2.

(15) *"Leak"* means the release of any particulate matter from any opening in the emission collection system/device prior to the intended exhaust or emission point of that emission control system/device.

(16) *"Modification"* means:

(A) any existing thermal spraying operation that did not use materials containing chromium, chromium compounds, nickel or nickel compounds prior to July 1, 2005, but begins using any of these materials after July 1, 2005; or

(B) any physical change in, change in the method of operation of, or addition to an existing permit unit that requires an application for an authority to construct and/or a permit to operate issued by the permitting agency. Routine maintenance and/or repair shall not be considered a physical change. A change in the method of operation of equipment, unless previously limited by an enforceable permit condition, shall not include:

1. an increase in the production rate, unless such increase will result in an increase in emissions that causes a move from a lower tier to a higher tier in subsection (c)(1)(A) Table 1 or Table 2 of this regulation; or
2. an increase in the hours of operation; or
3. a change in ownership of a source; or

(C) the fixed capital cost of the replacement of components exceeding 50 percent of the fixed capital cost that would be required to construct a comparable new source.

(17) *"Modified Thermal Spraying Operation"* means a thermal spraying operation which has undergone a modification.

(18) *"New Thermal Spraying Operation"* means a thermal spraying process that begins operating after July 1, 2005.

(19) *"Operating Parameter"* means a parameter established for a control device or process parameter which, if achieved by itself or in combination with one or more other operating parameter values, determines that an owner or operator is in compliance with the applicable emission limitation or standard.

(20) *"Permit Unit"* means any article, machine, piece of equipment, device, process, or combination thereof, which may cause or control the release of air emissions of hexavalent chromium or nickel from a thermal spraying process and which requires a permit to operate, issued by a permitting agency.

(21) *"Permitting Agency"* means the local air pollution control or air quality management district.

(22) *"Plasma Spraying"* means a thermal spraying process in which an electric arc is used to ionize a gas and produce a plasma jet that melts and propels the coating material to the workpiece.

(23) *"Point Source"* means a permit unit that releases air pollutants through an intended opening such as, but not limited to, a stack, chimney, or vent.

(24) *"Portable Thermal Spraying Operation"* means a thermal spraying process that is temporarily used for field applications at offsite locations. This definition does not include thermal spraying processes that are moved from one location to another location at the same stationary source.

(25) *"Potential to Emit"* means the maximum capacity of a stationary source to emit a regulated air pollutant based on its physical and operational design. Any physical or operational limitation on the capacity of the stationary source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design only if the limitations are listed as enforceable conditions in an air permit issued by the permitting agency.

(26) *"Sensitive Receptor"* means any residence including private homes, condominiums, apartments, and living quarters; education resources such as preschools and kindergarten through grade twelve (k-12) schools; and health care facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes individuals housed in long term care hospitals, prisons, and dormitories or similar live-in housing.

(27) *"Stationary Source"* means any building, structure, facility or installation which emits any affected pollutant directly or as a fugitive emission. Building, structure, facility, or installation includes all pollutant emitting activities which meet all of the following criteria:

(A) are under the same ownership or operation, or which are owned or operated by entities which are under common control; and
(B) belong to the same industrial grouping either by virtue of falling within the same two-digit standard industrial classification code or by virtue of being part of a common industrial process, manufacturing process, or connected process involving a common raw material; and
(C) are located on one or more contiguous or adjacent properties.

(28) *"Thermal Spraying"* means any one of several processes in which metallic or nonmetallic surfacing materials are deposited in a molten or semi-molten condition on a substrate to form a coating. The surfacing material may originate in the form of powder, rod, or wire before it is heated, prior to spraying and deposition. Thermal spraying processes include: detonation gun spraying, flame spraying, high-velocity oxy-fuel spraying, plasma spraying, and twin-wire electric arc spraying. For the purposes of this regulation, thermal spraying only includes those operations that are conducted at stationary sources. Thermal spraying excludes portable thermal spraying operations.

(29) *"Twin-Wire Electric Arc Spraying"* means a thermal spraying process where two electrically conducting wires are brought close together to create an electric arc. The molten material formed in the arc is then projected by a compressed gas stream towards a work piece on which it forms a coating.

(30) *"Volume Source"* means a permit unit, either controlled or uncontrolled, in which air pollutants undergo initial dispersion within a building or structure prior to their release into the outdoor ambient air. This definition also includes a thermal spraying process that is conducted outside of a building or structure and releases pollutants directly into the outdoor ambient air.

(31) *"Water Curtain"* means a particulate control system that utilizes flowing water (i.e., a conventional water curtain) or a pumpless system to remove particulate emissions from the exhaust air stream.

(c) Standards

(1) *Standards for Existing Thermal Spraying Operations*
Effective January 1, 2006, each owner or operator of an existing thermal spraying operation shall control hexavalent chromium and nickel emissions by complying with the control efficiency requirements in subsection (c)(1)(A), the enclosure standards in subsection (c)(1)(B), and the ventilation system standards in subsection (c)(1)(C). Annual hexavalent chromium and nickel emissions and maximum hourly nickel emissions shall be determined in accordance with the emission calculation

methods in Appendix 1 or may be based on the results of an emissions source test. The use of source test data must be approved by the permitting agency and the test must be conducted by an independent tester.

(A) *Control Efficiency Requirements for Existing Thermal Spraying Operations*

All existing thermal spraying operations shall control hexavalent chromium and nickel emissions as follows:

1. All hexavalent chromium and nickel emissions from thermal spraying operations shall be routed through an air pollution control system that meets the enclosure and ventilation standards in subsections (c)(1)(B) and (c)(1)(C).
2. For point sources, maximum hourly emissions of nickel from all thermal spraying operations shall not exceed 0.1 lb. For volume sources, maximum hourly emissions of nickel from all thermal spraying operations shall not exceed 0.01 lb.
3. For point sources, the air pollution control system shall include a control device that is certified by its manufacturer to meet the minimum control efficiency requirements specified in Table 1 of subsection (c)(1)(A). For volume sources, the air pollution control system shall include a control device that is certified by its manufacturer to meet the minimum control efficiency requirements specified in Table 2 of subsection (c)(1)(A). Emissions of hexavalent chromium and/or nickel from all thermal spraying operations at a stationary source must be included when determining the annual emissions from thermal spraying under subsection (c)(1)(A). If an existing control device meets the minimum control efficiency requirements specified in subsection (c)(1)(A), no additional controls are required by this regulation. If a thermal spraying operation has an air permit that limits the use of chromium and nickel to specific thermal spraying permit units, the control efficiency requirements only apply to those specific thermal spraying permit units.
4. All thermal spraying operations that are subject to more than one minimum control efficiency requirement under subsection (c)(1)(A) shall comply with the most stringent applicable requirement.
5. The requirements in subsections (c)(1)(A), (c)(1)(B), and (c)(1)(C) shall not apply to thermal spraying operations that meet all of the following criteria:
   (i) For point sources, annual emissions of hexavalent chromium and nickel are less than the minimum emissions in Table 1 of subsection (c)(1)(A). For volume sources, annual emissions of hexavalent chromium and nickel are less than the minimum emissions in Table 2 of subsection (c)(1)(A); and

(ii) For point sources, maximum hourly emissions of nickel from all thermal spraying operations do not exceed 0.1 lb. For volume sources, maximum hourly emissions of nickel from all thermal spraying operations do not exceed 0.01 lb.

Table 1: Point Sources -
Control Efficiency Requirements for Existing Thermal Spraying Operations

Tier	Annual Hexavalent Chromium Emissions from Thermal Spraying [1]	Annual Nickel Emissions from Thermal Spraying[1]	Minimum Control Efficiency Requirements [2]
1	≥ 0.004 lbs/yr and ≤ 0.04 lbs/yr	≥ 2.1 lbs/yr and ≤ 20.8 lbs/yr	90% by weight
2	> 0.04 lbs/yr and ≤ 0.4 lbs/yr	> 20.8 lbs/yr and ≤ 208 lbs/yr	99.999% @ 0.5 microns
3	> 0.4 lbs/yr	> 208 lbs/yr	99.97% @ 0.3 microns

1. Emissions are controlled emissions from all thermal spraying operations, if the facility is already equipped with a control device.
   a. For non-permitted sources, annual emissions shall be determined in accordance with the emission calculation methods in Appendix 1 or based on the results of an emissions source test that has been reviewed and approved by the permitting agency.
   b. For permitted sources, annual emissions shall be calculated based on the potential to emit or in accordance with the allowable limits set forth in the permit conditions.
2. Control efficiency requirements must be certified by the manufacturer/supplier of the control device and/or filter media. Facilities are not required to conduct an emissions source test to verify the control efficiency at the listed particle sizes. Control devices that meet the 99.97% @ 0.3 microns Tier 3 requirement are considered more efficient than devices that meet the 99.999% @ 0.5 microns Tier 2 requirement, because Tier 3 devices must be certified down to a smaller 0.3 micron particle size.

Table 2: Volume Sources -
Control Efficiency Requirements for Existing Thermal Spraying Operations

Tier	Annual Hexavalent Chromium Emissions from Thermal Spraying [1]	Annual Nickel Emissions from Thermal Spraying [1]	Minimum Control Efficiency Requirements [2]
1	≥ 0.001 lbs/yr and ≤ 0.01 lbs/yr	≥ 0.3 lbs/yr and ≤ 3.1 lbs/yr	99% by weight
2	> 0.01 lbs/yr and ≤ 0.1 lbs/yr	> 3.1 lbs/yr and ≤ 31 lbs/yr	99.999% @ 0.5 microns
3	> 0.1 lbs/yr	> 31 lbs/yr	99.97% @ 0.3 microns

1. Emissions are controlled emissions from all thermal spraying operations, if the facility is already equipped with a control device.
   a. For non-permitted sources, annual emissions shall be determined in accordance with the emission calculation methods in Appendix 1 or based on the results of an emissions source test that has been reviewed and approved by the permitting agency.
   b. For permitted sources, annual emissions shall be calculated based on the potential to emit or in accordance with the allowable limits set forth in the permit conditions.
2. Control efficiency requirements must be certified by the manufacturer/supplier of the control device and/or filter media. Facilities are not required to conduct an emissions source test to verify the control efficiency at the listed particle sizes. Control devices that meet the 99.97% @ 0.3 microns Tier 3 requirement are considered more efficient than devices that meet the 99.999% @ 0.5 microns Tier 2 requirement, because Tier 3 devices must be certified down to a smaller 0.3 micron particle size.

(B) *Enclosure Standards*

All existing thermal spraying operations that are subject to subsection (c)(1)(A) shall use air pollution control systems that meet the following criteria by January 1, 2006. All modified or new thermal spraying operations that are subject to subsection (c)(2)(A)2. or (c)(3)(A)1., respectively, shall use air pollution control systems that meet the following criteria upon initial startup.

1. Enclosures shall be exhaust ventilated such that a continuous inward flow of air is maintained from all designed make-up air openings during thermal spraying operations.
2. To ensure good capture of airborne pollutants, the average inward face velocity of air through the enclosure shall either be:
   (i) a minimum of 100 feet per minute; or
   (ii) the minimum velocity for metal spraying facilities as established in "Industrial Ventilation, A Manual of Recommended Practice" published by the American Conference of Governmental Industrial Hygienists and incorporated by reference herein.

   The inward face velocity must be confirmed by a velocity measuring device approved by the permitting agency (e.g., a pitot tube or anemometer.) Measurement of inward face velocity shall be performed in accordance with the methods in Appendix 2 or an alternative method approved by the permitting agency.

3. When thermal spraying is being performed, all air inlets and access openings shall be covered to prevent the escape of dust or mist contaminants into areas outside the enclosure. This requirement does not apply to any designed or intended make-up air vents or openings. Coverings can be permanent (e.g., a door) or temporary (e.g., plastic flaps). Temporary coverings must be approved by the permitting agency.
4. Before the enclosure is opened, thermal spraying shall cease and the exhaust system shall be run for a sufficient period of time, as determined by the permitting agency, to remove contaminated air within the enclosure. A minimum of three air exchanges shall be exhausted from the booth after thermal spraying ceases.

(C) *Ventilation System Standards*

For existing thermal spraying operations, the exhaust gas stream from the air pollution control system required by subsection (c)(1)(B) shall be ducted to a particulate matter control device meeting the applicable control efficiency requirements of subsection (c)(1)(A) by January 1, 2006. For modified or new thermal spraying operations, the exhaust gas stream from the air pollution control collection system required by subsection (c)(1)(B) shall be ducted to a particulate matter control device meeting the applicable control efficiency requirements of subsection (c)(2)(A)2. or (c)(3)(A)1., respectively, upon initial startup.

1. The ventilation system and control device shall be properly maintained and kept in good operating condition at all times. Any leak, as determined by a visual leak inspection conducted in accordance with Appendix 3, would be a violation of this section.
2. Material collected by a particulate matter control system shall be discharged into closed containers or an enclosed system that is completely sealed to prevent dust emissions.
3. Dust collectors for control devices shall be maintained in a manner that prevents emissions of particulate matter into the ambient air.

(D) Permit Requirements for Existing Thermal Spraying Operations

All unpermitted existing thermal spraying operations shall submit a permit application to the permitting agency no later than October 1, 2005. This permitting requirement only applies to existing thermal spraying operations that use materials containing chromium, chromium compounds, nickel, or nickel compounds.

(E) Exemption for Remotely Located Existing Thermal Spraying Operations

1. The requirements of subsections (c)(1)(A), (c)(1)(B), and (c)(1)(C) do not apply to existing thermal spraying operations that meet all of the following criteria:

(i) The thermal spraying operation is located at least 500 meters from a sensitive receptor, as determined by the permitting agency; and
(ii) Annual emissions of hexavalent chromium from all thermal spraying operations do not exceed 0.5 lb; and
(iii) The facility complies with the permitting requirements of subsection (c)(1)(D); and
(iv) The owner or operator of the thermal spraying operation has submitted an annual report to the permitting agency by March 1st of each calendar year, that quantifies emissions of hexavalent chromium and nickel from all thermal spraying operations during the previous calendar year.

2. Facilities that qualify for this exemption must undergo an annual evaluation by the permitting agency to ensure that the thermal spraying operation still complies with the conditions of this exemption. This exemption shall cease to apply if the permitting agency determines that the thermal spraying operation no longer meets all of the criteria in subsection (c)(1)(E)1. If the permitting agency determines that the exemption ceases to apply, the owner or operator of the thermal spraying operation must submit a compliance plan to the permitting agency within 3 months of receipt of the permitting agency's determination.

(2) *Standards for Modified Thermal Spraying Operations*

(A) Upon initial startup, each owner or operator of a modified thermal spraying operation shall comply with all of the following requirements:

1. Modified thermal spraying operations must control hexavalent chromium and nickel emissions by complying with the control efficiency requirements specified in subsection (c)(2)(A)2.

2. All thermal spraying operations that undergo a modification after July 1, 2005, shall use a control device that is certified by the manufacturer to achieve 99.97 percent control efficiency for particles that are 0.3 micron in diameter. These thermal spraying operations must also comply with the enclosure standards specified in subsection (c)(1)(B), and the ventilation standards specified in subsection (c)(1)(C).

3. For point sources, the maximum hourly emissions of nickel from all thermal spraying operations shall not exceed 0.1 lb. For volume sources, the maximum hourly emissions of nickel from all thermal spraying operations shall not exceed 0.01 lb. Maximum hourly nickel emissions shall be determined in accordance with the emission calculation methods in Appendix 1 or may be based on the results of an emissions source test. The use of source test data must be approved by the permitting agency and the test must be

conducted by an independent tester.

4. All thermal spraying operations that undergo a modification after July 1, 2005, shall submit a permit modification application to the permitting agency, in accordance with permitting agency requirements. This permitting requirement only applies to thermal spraying operations that use materials containing chromium, chromium compounds, nickel, or nickel compounds.

(3) *Standards for New Thermal Spraying Operations*

(A) A person may not operate a new thermal spraying operation unless it meets all of the following criteria:

1. New thermal spraying operations must use a control device that is certified by the manufacturer to achieve 99.97 percent control efficiency for particles that are 0.3 micron in diameter. Upon initial startup, these sources must also comply with the enclosure standards specified in subsection (c)(1)(B), and the ventilation standards specified in subsection (c)(1)(C).

2. The maximum hourly emissions of nickel from all thermal spraying operations shall not exceed 0.1 lb. Maximum hourly nickel emissions shall be determined in accordance with the emission calculation methods in Appendix 1 or may be based on the results of an emissions source test. The use of source test data must be approved by the permitting agency and the test must be conducted by an independent tester.

3. The thermal spraying operation must be located outside of an area that is zoned for residential or mixed use and it must be located at least 150 meters from the boundary of any area that is zoned for residential or mixed use.

4. Prior to initial startup, the thermal spraying operation must undergo a site specific analysis from the permitting agency to ensure public health protection.

(B) *Permit Requirements for New Thermal Spraying Operations*

All new thermal spraying operations shall submit a permit application to the permitting agency prior to initial startup, in accordance with permitting agency requirements. This permitting requirement only applies to new thermal spraying operations that use materials containing chromium, chromium compounds, nickel, or nickel compounds.

(d) Test Requirements and Test Methods

(1) Testing to Demonstrate Compliance with Enclosure and Ventilation Standards

(A) The owner or operator of an existing thermal spraying operation subject to the control efficiency requirements in subsection (c)(1)(A), shall conduct a test to demonstrate compliance with the enclosure and ventilation standards in subsections (c)(1)(B) and (c)(1)(C). The test must include measurement of the inward face velocity (per Appendix 2) and a visual leak inspection (per Appendix 3.) This test must be conducted within 60 days of the effective date of this regulation. The owner or operator must notify the permitting agency at least 30 days prior to conducting a test. Although 60 days are allowed for testing, all facilities must comply with specified control efficiency requirements, enclosure standards, and ventilation standards by January 1, 2006.

(B) The owner or operator of a modified or new thermal spraying operation subject to the control efficiency requirements in subsections (c)(2)(A)2. or (c)(3)(A)1., respectively, shall conduct a test to demonstrate compliance with the enclosure and ventilation standards in subsections (c)(1)(B) and (c)(1)(C). The test must include measurement of the inward face velocity (per Appendix 2) and a visual leak inspection (per Appendix 3.) This test must be conducted within 60 days after initial startup. The owner or operator must notify the permitting agency at least 30 days prior to conducting a test. Although 60 days are allowed for testing, all facilities must comply with specified control efficiency requirements, enclosure standards, and ventilation standards upon initial startup.

(2) Verification of Control Efficiency

Existing thermal spraying operations that are subject to Tier 2 or Tier 3 control efficiency requirements under subsection(c)(1)(A), modified thermal spraying operations that are subject to subsection (c)(2)(A)2., and new thermal spraying operations that are subject to subsection (c)(3)(A)1., must use control devices with a control efficiency verified by the manufacturer. The manufacturer must verify the control efficiency using one of the following test methods, which are incorporated by reference herein:

(A) ASHRAE Standard 52.2-1999, “Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size”, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc., 1791 Tullie Circle NE, Atlanta, GA 30329. 1999.

(B) MIL-PRF-51526A(EA), "Filter, Particulate, 340 CMH (200 CFM), 13 March 2000, U.S. Army.
(C) ASME AG-1-2003, "Code on Nuclear Air and Gas Treatment", American Society of Mechanical Engineers, 345 E. 47th St., New York, NY 10017. 2003.
(D) IEST-RP-CC001.3, "HEPA and ULPA Filters", Institute of Environmental Sciences and Technology, 5005 Newport Drive, Suite 506, Rolling Meadows, IL 60008-3841. 1993.

(3) Source Tests to Determine Emissions of Hexavalent Chromium and Nickel
Owners or operators of thermal spraying operations may choose to quantify hexavalent chromium and/or nickel emissions using data from a source test, rather than using the calculation methods in Appendix 1. In addition, a permitting agency may require that a source test be performed to quantify hexavalent chromium and/or nickel emissions from thermal spraying operations. The use of source test data must comply with the requirements in subsection (d)(3).

(A) *Use of Existing Source Tests*
A source test conducted prior to January 1, 2006, may be used to quantify emissions or demonstrate compliance with the standards in subsection (c)(1)(A), if the permitting agency approves the use of that test. The test must be conducted by an independent tester, in accordance with a test protocol that was reviewed and approved by the permitting agency.

(B) *Test Methods*
If the owner or operator of a thermal spraying operation conducts a source test to quantify emissions of hexavalent chromium and/or nickel, the testing must be conducted in accordance with the following listed test methods, which are incorporated by reference herein, or in accordance with alternative test methods approved by the permitting agency.

1. Testing to determine emissions of hexavalent chromium shall be conducted in accordance with one of the following test methods:

   ARB Test Method 425, "Determination of Total Chromium and Hexavalent Chromium Emissions from Stationary Sources", last amended July 28, 1997, Section 94135, Title 17, California Code of Regulations (CCR).

   EPA Test Method 306, "Determination of Chromium Emissions From Decorative and Hard Chromium Electroplating and Chromium Anodizing Operations – Isokinetic Method", 40 CFR 63, Appendix A.

South Coast Air Quality Management District (SCAQMD) Test Method 205.1, "Determination of Hexavalent and Total Chromium from Plating", August 1991.

2. Testing to determine emissions of nickel shall be conducted in accordance with one of the following test methods:

   ARB Test Method 433, "Determination of Total Nickel Emissions from Stationary Sources", last amended September 12, 1989, Section 94145, Title 17 California Code of Regulations (CCR).

   ARB Test Method 436, "Determination of Multiple Metals Emissions from Stationary Sources" (for nickel only), adopted July 28, 1997, Section 94161, Title 17 California Code of Regulations (CCR).

(C) The owner or operator of a thermal spraying operation that is conducting a source test must submit a pre-test protocol to the permitting agency, in accordance with permitting agency procedures, at least 60 days prior to conducting a source test. The pre-test protocol shall include source test methods, planned sampling parameters, preliminary pollutant analytical data, calculated targets for testing the pollutant, and any proposed modifications to standardized methods. In addition, the pre-test protocol shall include information on equipment, logistics, personnel, and any other information required by the permitting agency.

(e) Monitoring, Inspection, and Maintenance Requirements

(1) Monitoring Requirements

Thermal spraying operations with air pollution control systems shall comply with the applicable monitoring requirements listed in Table 3 of subsection (e)(1). In addition, other operating parameters, as designated by the permitting agency, shall be monitored while conducting thermal spraying to ensure compliance with requirements in subsection (c).

Table 3 – Summary of Monitoring Requirements for Sources Using Add-on Air Pollution Control Devices

	Control Equipment	Monitoring Requirements
(A)	Dry particulate filter system (e.g., dry filter cartridge, HEPA filter)	1. The pressure differential gauge shall continuously monitor pressure drop across the control device while conducting thermal spraying. 2. Record pressure drop once per shift while conducting thermal spraying.
(B)	Conventional Water Curtain	1. The flow meter shall continuously monitor the water flow rate while conducting thermal spraying. 2. Monitor the water curtain continuity by visual observation to ensure that there are no gaps while conducting thermal spraying. 3. Record water flow rate and water curtain continuity once per week while conducting thermal spraying.
(C)	Pumpless Water Curtain	1. Monitor parameters that indicate booth performance, per manufacturer's recommendation, while conducting thermal spraying. 2. Visually inspect the water curtain for continuity to ensure that there are no gaps while conducting thermal spraying. 3. Record recommended parameters and water curtain continuity once per week while conducting thermal spraying.

(2) Pressure Drop Monitoring Requirements

All dry particulate control devices (e.g., dry filter cartridges or HEPA filters) shall have gauges that continuously monitor the pressure drop across each control device when thermal spraying is occurring. The gauge must have a high and low setting for the pressure drop and must trigger an alarm system when the high or low set points are exceeded or during the cleaning cycle when the high set point is exceeded. The gauge must be designed to accurately measure pressure drops within the expected range and have an accuracy of at least $\pm$ 5% of full scale. The gauge shall be located so that it can be easily visible and in clear sight of the operation or maintenance personnel. The pressure drop shall be maintained per manufacturer's specifications. If the pressure drop is outside of the acceptable limits, the owner or operator shall shut down the thermal spraying operation immediately and take corrective action. The thermal spraying operation shall not be resumed until the pressure drop is within the specified limit(s).

(3) Water Curtain Monitoring Requirements

For thermal spraying operations that are conducted in water curtain booths, the owner or operator shall monitor booth operating parameters during thermal spraying to ensure compliance with the requirements in subsection (c). Water curtain booths shall provide a continuous sheet of water down the rear wall of the booth. For all water curtain booths, the

owner or operator shall visually monitor the water curtain during thermal spraying to ensure that the sheet is continuous without any gaps or dry spots. The owner or operator of a conventional water curtain booth shall continuously monitor the water flow rate with a flow meter during thermal spraying. The owner or operator of a pumpless water curtain booth shall monitor the parameters recommended by the booth manufacturer. If the water curtain fails the continuity and/or flow requirements, the owner or operator shall check to ensure the water flow meets or exceeds the minimum acceptable flow rate and shut down the thermal spraying operation immediately to take corrective action. The thermal spraying operation shall not be resumed until the monitored parameters comply with the specified limits.

(4) Inspection and Maintenance Requirements

Thermal spraying operations with air pollution control systems shall comply with the applicable inspection and maintenance requirements listed in Table 4.

Table 4 - Summary of Inspection and Maintenance Requirements for Sources Using Add-on Air Pollution Control Devices

	Control Equipment	Inspection & Maintenance Requirements	Frequency
(A)	Dry particulate filter system (e.g., dry filter cartridge, HEPA filter)	1. Visually inspect device and filter media to ensure there are no leaks (per Appendix 3).	At least once every 90 days.
		2. Visually inspect ductwork from work area to the control device to ensure there are no leaks (per Appendix 3).	At least once every 90 days.
		3. Replace filter.	Per manufacturer's specifications or permitting agency's requirement.
(B)	Water Curtain	1. Visually inspect ductwork from booth to the exhaust stack to ensure there are no leaks (per Appendix 3).	At least once every 90 days.
(C)	All	1. Measure inward face velocity at each opening (per Appendix 2).	At least once every 30 days

(f) Recordkeeping Requirements

(1) Monitoring Data Records

The owner or operator shall maintain records of monitoring data required by subsection (e), including the date and time the data are collected. Recordkeeping logs shall include the applicable acceptable limit(s) for: pressure drop (dry particulate control); water flow rate (conventional water curtain); or manufacturer’s recommended parameter limits (pumpless water curtain).

(2) Inspection Records

The owner or operator shall maintain inspection records that clearly document all inspections and maintenance activities to enable the permitting agency to determine whether the requirements of subsection (e)(4) have been met. The records may take the form of a checklist and shall identify:

(A) the name of the device inspected;
(B) the date and time of inspection;
(C) a brief description of the working condition of the device during the inspection;
(D) all maintenance activities performed on the components of the air pollution control system (e.g., duct work replacement, filter replacement, fan replacement, leak repairs, etc.);
(E) actions taken to correct deficiencies found during the inspection; and
(F) person that conducted the inspection.

(3) Material Usage Records

For thermal spraying materials that contain chromium, chromium compounds, nickel, or nickel compounds, the owner or operator shall record the name and quantity of material used during each month of the annual reporting period, and the total usage to date for that calendar year.

(4) Source Test Records

The owner or operator shall maintain test reports documenting the conditions and results of all source tests.

(5) Equipment Malfunctions and Failures

The owner or operator shall maintain records of the occurrence, duration, cause (if known), and action taken for each equipment malfunction and/or failure.

(6) Records Maintenance and Retention

All records must be readily accessible for inspection and review at the facility at least five years. If so requested by the permitting agency, the owner or operator must provide copies of the records to the permitting agency.

(g) Reporting Requirements

(1) Initial Emission Inventory for Existing Sources

All existing thermal spraying operations shall submit an emission inventory for hexavalent chromium and nickel to the permitting agency no later than October 1, 2005. This inventory must include thermal spraying operations conducted during the 12-month period between July 1, 2004 and July 1, 2005. The inventory must include all thermal spraying operations that use

materials containing chromium, chromium compounds, nickel, or nickel compounds. The emission inventory must be prepared in accordance with Appendix 1 or based on an emissions source test approved by the permitting agency.

(2) Annual Emission Inventory for Existing Sources Qualifying for Exemption
Remotely located thermal spraying operations that qualify for the exemption in subsection (c)(1)(E) must submit an annual report to the permitting agency by March 1st of each calendar year that quantifies emissions of hexavalent chromium and nickel from thermal spraying operations during the previous calendar year.

(3) Initial Notification
Existing thermal spraying operations that begin using materials containing chromium, chromium compounds, nickel, or nickel compounds after July 1, 2005, shall notify the permitting agency at least 45 days prior to use of these materials.

(4) Reports of Breakdowns, Equipment Malfunctions, and Failures
The owner or operator of a thermal spraying operation shall report breakdowns, equipment malfunctions, and failures as required by the permitting agency.

(5) Source Test Documentation

(A) *Notification of Source Test*
The owner or operator of a thermal spraying operation shall notify the permitting agency of his or her intention to conduct a source test to measure emissions of hexavalent chromium and/or nickel. The owner or operator must provide this notification to the permitting agency at least 60 calendar days before the source test is scheduled. The notification shall include a pre-test protocol, and any other documentation required by the permitting agency.

(B) *Reports of Source Test Results*
The owner or operator of a thermal spraying operation shall provide the source test results to the permitting agency no later than 60 days following the completion of testing.

(6) Adjustments to the Timeline for Submittal and Format of Reports
A permitting agency may adjust the timeline for submittal of periodic reports, allow consolidation of multiple reports into a single report, establish a common schedule for submittal of reports, or accept reports prepared to comply with other State or local requirements. Prior to allowing an adjustment, the permitting agency must find that the

adjustment will provide the same information and will not alter or reduce the overall frequency of reporting.

(h) Severability

Each part of this subchapter is deemed severable, and in the event that any part of this subchapter is held to be invalid, the remainder of this subchapter shall continue in full force and effect.

Appendix 1 – Emission Calculation Method

Emissions of hexavalent chromium (Cr^{+6}) and nickel (Ni) from thermal spraying operations shall be calculated in accordance with the procedures contained in this appendix.

Step 1: Identify all thermal spraying materials that contain chromium (Cr) or nickel (Ni) at a concentration of at least 0.1% by weight (or less than 0.1%, if listed on the Material Safety Data Sheet.) Include materials that contain chromium or nickel in the form of a metallic compound or alloy. Examples of compounds and alloys include, but are not limited to, stainless steel; chromium carbide (Cr_3C_2); nichrome alloys (NiCr); and chromium oxide (Cr_2O_3).

Step 2: Determine the total percentage of chromium and/or nickel contained in each thermal spraying material. These data can be obtained from the material safety data sheet (MSDS) or by contacting the manufacturer. If the material contains a compound (e.g., Cr_3C_2), only include the portion that is chromium or nickel.

Step 3: For each thermal spraying operation, compile the annual usage for each thermal spraying material that contains chromium or nickel. For sources that have air permits, the annual usage is the maximum allowable under the permit.

Step 4: For each thermal spraying operation, calculate the annual usage quantities for chromium and nickel with the following equations:

Eqn. 1: [Annual Usage, lbs Cr/yr] = [Material Usage, lbs material used/yr][weight % Cr in Material]*

Eqn. 2: [Annual Usage, lbs Ni/yr] = [Material Usage, lbs material used/yr][weight % Ni in Material]*

Step 5. Identify the appropriate emission factor(s) for each thermal spraying process, based on the applicable control efficiency level. If a material was used for more than one type of thermal spraying process, use the highest emission factor.

Table 1-1 summarizes the applicable emission factors for thermal spraying processes using materials that contain chromium, chromium compounds, or chromium alloys.

Table 1-2 summarizes the applicable emission factors for thermal spraying processes using materials that contain nickel, nickel compounds, or nickel alloys.

Appendix 1 – Emission Calculation Method

Table 1-1: Thermal Spraying Emission Factors for Hexavalent Chromium

Process	Emission Factors (lbs Cr^{+6}/lb Cr sprayed)*			
	0% Control Efficiency (Uncontrolled)	90% Control Efficiency (e.g. Water Curtain)	99% Control Efficiency (e.g. Dry Filter)	99.97% Control Efficiency (e.g., HEPA Filter)
Single-Wire Flame Spray	4.68E-03	4.68E-04	4.68E-05	1.40E-06
Twin-Wire Electric Arc Spray	6.96E-03	6.96E-04	6.96E-05	2.09E-06
Flame Spray	6.20E-03	1.17E-03	6.20E-05	1.86E-06
HVOF	6.20E-03	1.17E-03	6.20E-05	1.86E-06
Plasma Spray	1.18E-02	6.73E-03	2.61E-03	2.86E-06
Other Thermal Spraying	7.17E-03	2.05E-03	5.70E-04	2.01E-06

*Some emission factors are based directly on stack test results while others are calculated values, derived from stack test results and control efficiencies.

Table 1-2: Thermal Spraying Emission Factors for Nickel

Process	Emission Factors (lbs Ni/lb Ni sprayed)*			
	0% Control Efficiency (Uncontrolled)	90% Control Efficiency (e.g. Water Curtain)	99% Control Efficiency (e.g. Dry Filter)	99.97% Control Efficiency (e.g., HEPA Filter)
Twin-Wire Electric Arc Spray	6.0E-03	6.0E-04	6.0E-05	1.8E-06
Flame Spray	1.10E-01	4.64E-02	1.10E-03	3.30E-05
HVOF	1.10E-01	4.64E-02	1.10E-03	3.30E-05
Plasma Spray	1.5E-01	3.67E-02	1.5E-03	1.72E-05
Other Thermal Spraying	9.4E-02	3.25E-02	9.4E-04	2.13E-05

*Some emission factors are based directly on stack test results while others are calculated values, derived from stack test results and control efficiencies.

Step 6 – Annual Emissions. For each thermal spraying process, calculate the annual emissions by multiplying the appropriate emission factors by the annual usage rates, with the following equations:

Eqn. 3: [Annual Emissions, lbs Cr^{+6}/yr] = [Emission Factor, lbs Cr^{+6}/lb Cr][Annual Usage, lbs Cr/yr]]*

Eqn. 4: [Annual Emissions, lbs Ni/yr] = [Emission Factor, lbs Ni/lb Ni sprayed][Annual Usage, lbs Ni sprayed/yr]*

Appendix 1 – Emission Calculation Method

Step 7 – Maximum Hourly Nickel Emissions: For each thermal spraying process that uses nickel, calculate the maximum hourly emissions by multiplying the appropriate emission factors by the maximum hourly usage rates, with the following equations:

Eqn. 5:
[Max. Hourly Emissions, lbs Ni/hr] = [Emission Factor, lbs Ni/lb Ni sprayed][Max. Hourly Usage, lbs Ni sprayed/hr]*

Eqn. 6:
[Max. Hourly Usage, lbs Ni sprayed/hr] = [Max. Gun Spray Rate, lbs material sprayed/hr][Max. wt.% Ni in material]*

where

"Maximum Gun Spray Rate" is the highest material throughput rate that a thermal spraying gun can achieve, based on manufacturer specifications or actual user experience, whichever is greater. If multiple guns have the potential to be operated at the same time (e.g., in two separate booths), the maximum gun spray rate must include the total throughput from all guns.

"Maximum Weight % Nickel in Material" is the highest weight percentage of nickel for all of the thermal spraying materials that are used in thermal spraying processes at a facility.

Appendix 1 – Emission Calculation Method

Point Source Example:

Thermal Spraying Inc. operates two thermal spraying booths. One booth is used for plasma spraying and the other booth is used for flame spraying and twin-wire electric arc spraying. Listed below is information on the facility's operations:

Booth	Control Device	Process	Materials Used	Quantity Used	% Total Chromium	% Nickel
Booth #1	HEPA Filter	Plasma Spray	Powder ABC	25 lbs/yr	25%	0%
			Powder XYZ	50 lbs/yr	20%	75%
Booth #2	Dry Filter (99% effic.)	Flame Spray	Powder 123	10 lbs/yr	0%	95%
			Powder XYZ	75 lbs/yr	20%	75%
		Twin-Wire	Wire #1	80 lbs/yr	20%	5%

An example calculation is provided below for Thermal Spraying Inc.:

Step 1: Identify all thermal spraying materials that contain at least 0.1% by weight of chromium (Cr) or nickel (Ni).

The following four products contain chromium or nickel: Powder 123; Powder ABC; Powder XYZ; Wire #1.

Step 2: Determine the total percentage of chromium and/or nickel.

Materials Used	% Total Chromium	% Nickel
Powder 123	0%	95%
Powder ABC	25%	0%
Powder XYZ	20%	75%
Wire #1	20%	5%

If a thermal spraying material contains a compound, only include the portion that is chromium or nickel. For example, if the material contains 95% chromium oxide (Cr_2O_3), the weight percent of chromium would be calculated as follows:

$$[\text{Chromium Weight \%}] = [\text{Weight \% } Cr_2O_3] * \frac{[\text{Molecular Weight of Chromium } (Cr_2)]}{[\text{Molecular Weight of Chromium Oxide } (Cr_2O_3)]}$$

Molecular Weight of Chromium (Cr_2) = (52 g/g-mol)*(2) = 104 g/g-mol
Molecular Weight of Chromium Oxide (Cr_2O_3) = (52 g/g-mol)*(2)+(16)*(3) = 152 g/g-mol

$$[\text{Chromium Weight \%}] = [95\ \%\ Cr_2O_3] * \frac{[104\ \text{g/g-mol}]}{[152\ \text{g/g-mol}]} = 65\%$$

Point Source Example (contd.):

Step 3: Compile the annual material usage.

Process	Materials Used	Quantity Used
Plasma Spray	Powder ABC	25 lbs/yr
	Powder XYZ	50 lbs/yr
Flame Spray	Powder 123	10 lbs/yr
	Powder XYZ	75 lbs/yr
Twin-Wire	Wire #1	80 lbs/yr

Step 4: Calculate the annual usage quantities for chromium and nickel.

Materials Used	Quantity Used	% Total Chromium	% Nickel	Qty. of Total Chromium Used	Qty. of Nickel Used
Powder ABC	25 lbs/yr	25%	0%	[25 lbs/yr]x[25% Cr] = **6.25** lbs Cr/yr	[25 lbs/yr]x[0% Ni] = **0** lbs Ni/yr
Powder XYZ	50 lbs/yr	20%	75%	[50 lbs/yr]x[20% Cr] = **10.0** lbs Cr/yr	[50 lbs/yr]x[75% Ni] = **37.5** lbs Ni/yr
Powder 123	10 lbs/yr	0%	95%	[10 lbs/yr]x[0% Cr] = **0** lbs Cr/yr	[10 lbs/yr]x[95% Ni] = **9.5** lbs Ni/yr
Powder XYZ	75 lbs/yr	20%	75%	[75 lbs/yr]x[20% Cr] = **15.0** lbs Cr/yr	[75 lbs/yr]x[75% Ni] = **56.25** lbs Ni/yr
Wire #1	80 lbs/yr	20%	5%	[80 lbs/yr]x[20% Cr] = **16.0** lbs Cr/yr	[80 lbs/yr]x[5% Ni] = **4.0** lbs Ni/yr

Step 5: Identify the appropriate emission factors.

Control Device	Process	Emission Factor - Hexavalent Chromium (lb Cr^{+6}/lb Cr)	Emission Factor – Nickel (lb Ni/lb Ni sprayed)
HEPA Filter	Plasma Spray	2.86E-06	1.72E-05
Dry Filter (99% effic.)	Flame Spray	6.20E-05	1.10E-03
	Twin-Wire	6.96E-05	6.0E-05

Point Source Example (contd.):

Step 6: Calculate annual emissions (*[Annual Emissions] = [Emission Factor]*[Annual Usage]*.)

For hexavalent chromium, the annual emissions are –

Booth	Control Device	Process	Materials Used	Qty. of Total Chromium Used (lbs Cr/yr)	Emission Factor (lb Cr^{+6}/lb Cr)	Annual Emissions (lb Cr^{+6}/yr)
#1	HEPA Filter	Plasma Spray	Powder ABC	6.25	2.86E-06	[6.25]x[2.86E-06] = **1.79E-05**
			Powder XYZ	10.0	2.86E-06	[10.0]x[2.86E-06] = **2.86E-05**
#2	Dry Filter (99% effic.)	Flame Spray	Powder 123	0	6.20E-05	[0]x[6.20E-05] = **0**
			Powder XYZ	15.0	6.20E-05	[15.0]x[6.20E-05] = **9.30E-04**
		Twin-Wire	Wire #1	16.0	6.96E-05	[16.0]x[6.96E-05] = **1.11E-03**
					Total =	**0.002**

Based on this emission level, Thermal Spraying Inc. is below the Tier 1 threshold for hexavalent chromium. Therefore, no new control efficiency requirements would be imposed by this ATCM because of hexavalent chromium emissions. However, Thermal Spraying Inc. will still need to comply with the permitting, monitoring, and recordkeeping requirements of the ATCM. In addition, if the workload increased and emissions exceeded Tier 1 thresholds, it would be necessary to upgrade the dry filter system or limit the usage of all chromium materials to the booth that has the HEPA filter.

For nickel, the annual emissions are –

Booth	Control Device	Process	Materials Used	Qty. of Nickel Used (lbs Ni/yr)	Emission Factor (lb Ni/lb Ni sprayed)	Annual Emissions (lb Ni/yr)
#1	HEPA Filter	Plasma Spray	Powder ABC	0	1.72E-05	[0]x[1.72E-05] = **0**
			Powder XYZ	37.5	1.72E-05	[37.5]x[1.72E-05] = **6.45E-04**
#2	Dry Filter (99% effic.)	Flame Spray	Powder 123	9.5	1.10E-03	[9.5]x[1.10E-03] = **1.05E-02**
			Powder XYZ	56.25	1.10E-03	[56.25]x[1.10E-03] = **6.19E-02**
		Twin-Wire	Wire #1	4.0	6.0E-05	[4.0]x[6.0E-05] = **2.40E-04**
					Total =	**0.073**

Point Source Example (contd.):

Based on this emission level, Thermal Spraying Inc. is below the Tier 1 threshold for nickel. Therefore, no new control efficiency requirements would be imposed by this ATCM because of nickel emissions. However, Thermal Spraying Inc. will still need to comply with the permitting, monitoring, and recordkeeping requirements of the ATCM. In addition, if the workload increased and emissions exceeded Tier 1 thresholds, it would be necessary to upgrade the dry filter system or limit the usage of all nickel materials to the booth that has the HEPA filter.

Step 7: Calculate the maximum hourly emissions for nickel.

Powder 123 is the material that has the highest weight percentage of nickel (95%).
The maximum spray rate for the flame spraying gun is 10 lbs/hr.
The emission factor for flame spraying is 1.10E-03 lb Ni/lb Ni sprayed.

[Maximum Hourly Usage] = [Maximum Gun Spray Rate]*[Maximum Wt.% Nickel]
[Maximum Hourly Usage] = [10 lbs/hr]*[95% Ni] = 9.5 lbs Ni sprayed/hr

[Maximum Hourly Emissions] = [Emission Factor]*[Maximum Hourly Usage]
Maximum Hourly Emissions = [1.10E-03 lb Ni/lb Ni sprayed]*[9.5 lbs Ni sprayed/hr] = 0.01 lb Ni/hr

The maximum hourly emissions for nickel are 0.01 lbs Ni/hr, which is well below the compliance limit of 0.1 lb Ni/hr for point sources. Therefore, this source complies with the maximum hourly limit for nickel.

Appendix 1 – Emission Calculation Method

Volume Source Example:

Machine Shop Inc. conducts flame spraying with powder on small parts. The parts are turned on a lathe while spraying is being performed. Since the lathe is not located in a booth, the shop uses a portable local exhaust fan to remove fumes from the worker's breathing area. This type of operation would be considered a volume source with 0% control efficiency. Listed below is information on the facility's operations:

Booth	Control Device	Process	Materials Used	Quantity Used	% Total Chromium	% Nickel
None	None (uncontrolled)	Flame Spray	Powder 123	20 lbs/yr	0%	95%
			Powder XYZ	5 lbs/yr	20%	75%

An example calculation is provided below for Machine Shop Inc.:

Step 1: Identify all thermal spraying materials that contain at least 0.1% by weight of chromium (Cr) or nickel (Ni).

The following two products contain chromium or nickel: Powder 123 and Powder XYZ.

Step 2: Determine the total percentage of chromium and/or nickel.

Materials Used	% Total Chromium	% Nickel
Powder 123	0%	95%
Powder XYZ	20%	75%

Step 3: Compile the annual material usage.

Process	Materials Used	Quantity Used
Flame Spray	Powder 123	20 lbs/yr
	Powder XYZ	5 lbs/yr

Step 4: Calculate the annual usage quantities for chromium and nickel.

Materials Used	Quantity Used	% Total Chromium	% Nickel	Qty. of Total Chromium Used	Qty. of Nickel Used
Powder 123	20 lbs/yr	0%	95%	[20 lbs/yr]x[0% Cr] = **0** lbs Cr/yr	[20 lbs/yr]x[95% Ni] = **19.0** lbs Ni/yr
Powder XYZ	5 lbs/yr	20%	75%	[5 lbs/yr]x[20% Cr] = **1.0** lbs Cr/yr	[5 lbs/yr]x[75% Ni] = **3.75** lbs Ni/yr

Volume Source Example (contd.):

Step 5: Identify the appropriate emission factors.

Control Device	Process	Emission Factor - Hexavalent Chromium (lb Cr^{+6}/lb Cr)	Emission Factor – Nickel (lb Ni/lb Ni sprayed)
Uncontrolled	Flame Spray	6.20E-03	1.10E-01

Step 6: Calculate annual emissions (*[Annual Emissions] = [Emission Factor]*[Annual Usage]*.)

For hexavalent chromium, the annual emissions are –

Booth	Control Device	Process	Materials Used	Qty. of Total Chromium Used (lbs Cr/yr)	Emission Factor (lb Cr^{+6}/lb Cr)	Annual Emissions (lb Cr^{+6}/yr)
None	None	Flame Spray	Powder 123	0	6.20E-03	[0]x[6.20E-03] = **0**
			Powder XYZ	1.0	6.20E-03	[1.0]x[6.20E-03] = **6.20E-03**
					Total =	**0.006**

Based on this emission level, Machine Shop Inc. is classified as Tier 1 for hexavalent chromium. Therefore, the facility would need to install a new booth with a control device that met the Tier 1 minimum efficiency requirement of 99%. In addition, Machine Shop Inc. would need to comply with the permitting, monitoring, and recordkeeping requirements of the ATCM. Machine Shop Inc. could avoid having to install a new booth and control device, if they eliminated the use of chromium-containing materials.

For nickel, the annual emissions are –

Booth	Control Device	Process	Materials Used	Qty. of Nickel Used (lbs Ni/yr)	Emission Factor (lb Ni/lb Ni sprayed)	Annual Emissions (lb Ni/yr)
None	None	Flame Spray	Powder 123	19.0	1.10E-01	[19.0]x[1.10E-01] = **2.09**
			Powder XYZ	3.75	1.10E-01	[3.75]x[1.10E-01] = **4.13E-01**
					Total =	**2.50**

Volume Source Example (contd.):

Based on this emission level, Machine Shop Inc. is below the Tier 1 threshold for nickel. Therefore, no new control efficiency requirements would be imposed by this ATCM because of nickel emissions. However, this ATCM requires facilities to comply with the most stringent control efficiency. Since the control efficiency requirement based on hexavalent chromium is the most stringent, they must comply with the 99% control efficiency.

Step 7: Calculate the maximum hourly emissions for nickel.

Powder 123 is the material that has the highest weight percentage of nickel (95%).
The maximum spray rate for the flame spraying gun is 10 lbs/hr.
The emission factor for flame spraying is 1.10E-01 lb Ni/lb Ni sprayed.

[Maximum Hourly Usage] = [Maximum Gun Spray Rate]*[Maximum Wt.% Nickel]
[Maximum Hourly Usage] = [10 lbs/hr]*[95 % Ni] = 9.5 lbs Ni sprayed/hr

[Maximum Hourly Emissions] = [Emission Factor]*[Maximum Hourly Usage]
Maximum Hourly Emissions = [1.10E-01 lb Ni/lb Ni sprayed]*[9.5 lbs Ni sprayed/hr] = 1.1 lb Ni/hr

The maximum hourly emissions for nickel are 1.1 lbs Ni/hr, which exceeds the compliance limit of 0.01 lb Ni/hr for volume sources. Therefore, this source does not comply with the maximum hourly limit for nickel and it would be necessary to reduce emissions (e.g., install a control device, limit usage, etc.)

Appendix 2 –Method for Measuring Inward Face Velocity

Inward face velocity must be measured at least once every 30 days to ensure that the ventilation system is working properly. Measurements must be conducted in accordance with the procedures in this appendix or an alternative method approved by the permitting agency.

1. Hood Measurement:

Divide the face of the hood, the slot area, or the normal plane, at the capture velocity measurement point into equal area rectangles (see Figure 1). The side of each rectangular area should be no longer than 12 inches. Measure the air velocity (fpm) at the center of each rectangle using a calibrated anemometer or other measuring device approved by the permitting agency. The velocity measuring device must have an accuracy of at least ±10% of full scale. The measuring device shall be in good condition, of proper velocity range, and operated according to the manufacturer's instructions. The measuring device must be calibrated in accordance with the manufacturer's recommendations. Do not block or disturb the airflow while taking the readings.

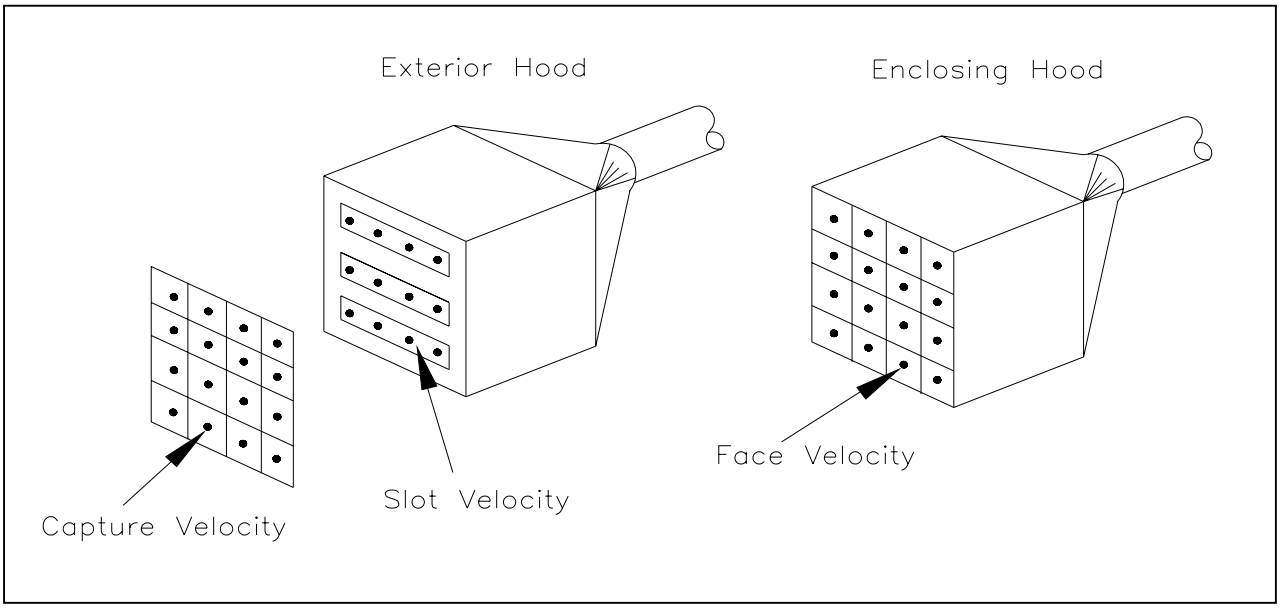

Figure 1: Airflow distribution measurement for an exterior hood and an enclosing hood

Measure the volumetric airflow rate through the hood by measuring the velocity at the center of each equal-sized rectangular area (i.e., by performing pitot traverses.) If no suitable location exists for performing complete pitot traverses, measure the slot velocity and use this data to estimate the volumetric airflow rate through a hood.

2. Walk-in Booth Measurement:

For a cross-draft walk-in booth (i.e., air enters through filters in the front of the booth and leaves through filters in the back of the booth):

Empty the walk-in booth prior to the airflow distribution measurement. Divide the **length** of the booth into at least three cross-sectional areas to obtain the velocity profile in the booth. One cross-sectional area must be located near the exhaust plenum, one close to the supply plenum, and the other in the middle of the booth. Figure 2 illustrates the location of cross-sectional areas. Record the distance between each cross-sectional area and the exhaust or supply plenums. The distance between each cross-sectional area must not exceed ten feet.

Lay out imaginary grid lines through each cross sectional area. Use the intersections of the grid lines as locations to measure velocities inside the booth. The intersection points must be no more than six feet apart. Record the location of each point on the grid. Measure the air velocity (fpm) at each intersection point on the grid using a calibrated anemometer or other measuring device approved by the permitting agency. The velocity measuring device must have an accuracy of at least ±10% of full scale. The measuring device shall be in good condition, of proper velocity range, and operated according to the manufacturer's instructions. The measuring device must be calibrated in accordance with the manufacturer's recommendations.

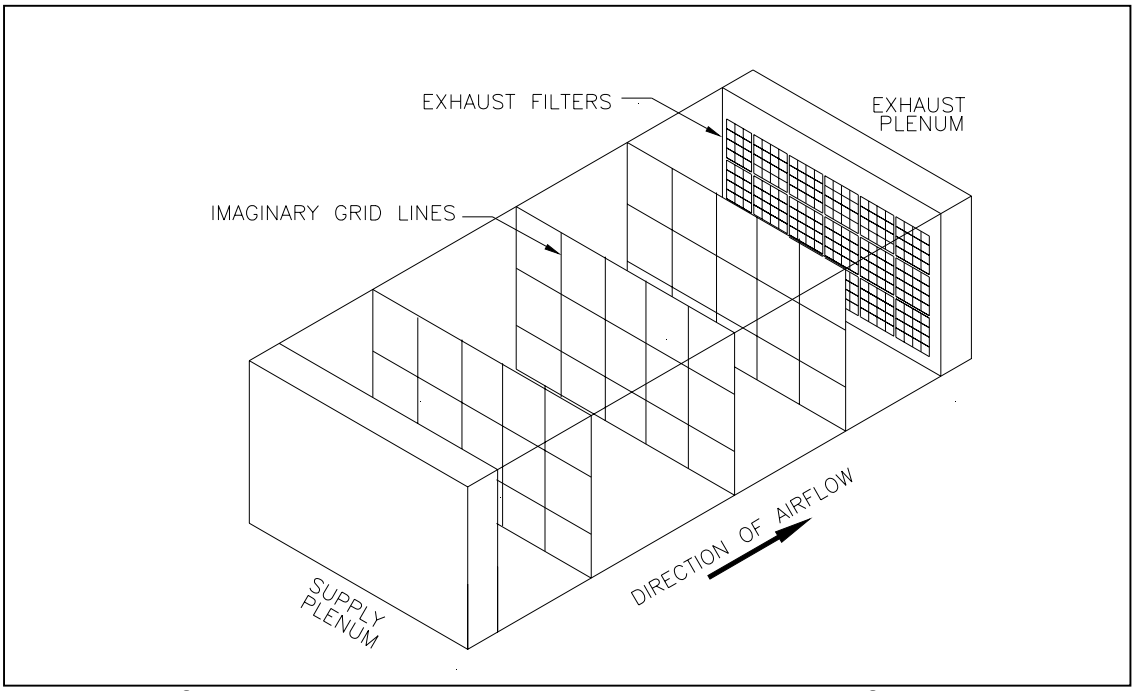

Figure 2: Airflow distribution measurement inside a cross-draft walk-in booth

Appendix 2 –Method for Measuring Inward Face Velocity

For a down-draft walk-in booth (i.e., air enters through filters in the ceiling of the booth and leaves through filters that cover trenches under a metal grate floor):

Empty the walk-in booth prior to the airflow distribution measurement. Divide the **height** of the booth into at least three cross-sectional areas to obtain the velocity profile in the booth. One cross-sectional area must be located near the exhaust plenum, one close to the supply plenum, and the other in the middle of the booth. Record the distance between each cross-sectional area and the exhaust or supply plenums. The distance between each cross-sectional area must not exceed ten feet.

Lay out imaginary grid lines through each cross sectional area. Use the intersections of the grid lines as locations to measure velocities inside the booth. The intersection points must be no more than six feet apart. Record the location of each point on the grid. Measure the air velocity (fpm) at each intersection point on the grid using a calibrated anemometer or other measuring device approved by the permitting agency. The velocity measuring device must have an accuracy of at least ±10% of full scale. The measuring device shall be in good condition, of proper velocity range, and operated according to the manufacturer's instructions. The measuring device must be calibrated in accordance with the manufacturer's recommendations.

3. Average Value of Readings

Calculate the average value for all velocity readings, if all individual readings are within ± 20% of the average value. Do not include turbulent readings when calculating the average (turbulent airflow may be indicated by negative or zero velocity readings.) Record and make available for inspection by the permitting agency the entire velocity profile to show the airflow distribution.

Examples:

Hood A – Velocity Readings (fpm)		
100	90	110
85	115	100
105	95	100
Average Velocity = 900 fpm / 9 = 100 fpm		

Hood B – Velocity Readings (fpm)		
200	200	0
200	50	0
100	-5 *	-45 *
Average velocity = 750 fpm / 7 = 107 fpm **		

* Negative values indicate airflow in reverse direction and are not included in the average.
** This is not a valid average, because individual readings are not within ±20% of the average. The booth airflow needs to be adjusted and balanced before the velocity is measured again.

Appendix 3 – Leak Check Visual Inspection Checklist

Visual inspections must be conducted at least once every 90 days to ensure that no leaks are present in the control device or ventilation system. At a minimum, the inspection must include the items listed in the following checklist that are applicable. In addition to the items on this checklist, facilities must inspect items in accordance with manufacturers' recommendations.

✓ Acceptable
✕ Unacceptable

Item to be Inspected	Look For -	Dates of Inspection:			
1. Hoods	Dents, holes, corrosion				
2. Ductwork	Dents, holes, corrosion				
	Blockages, plugging				
3. Dampers	Deterioration of seals/gaskets				
	Settings				
4. Access doors	Deterioration of seals/gaskets				
	Gaps when door is closed				
5. Fan housing	Deterioration of seals/gaskets				
	Gaps in connection to ductwork				
6. Dry filter media	Holes, gaps, abrasions				
	Does filter need to be changed?				
	Dust on clean side of filter?				
7. Dry filter mounting frame	Deterioration of seals/gaskets				
8. Other items inspected (provide descriptions):					
9. Corrective actions (provide descriptions & dates):					
10. Initials of person doing inspection:					